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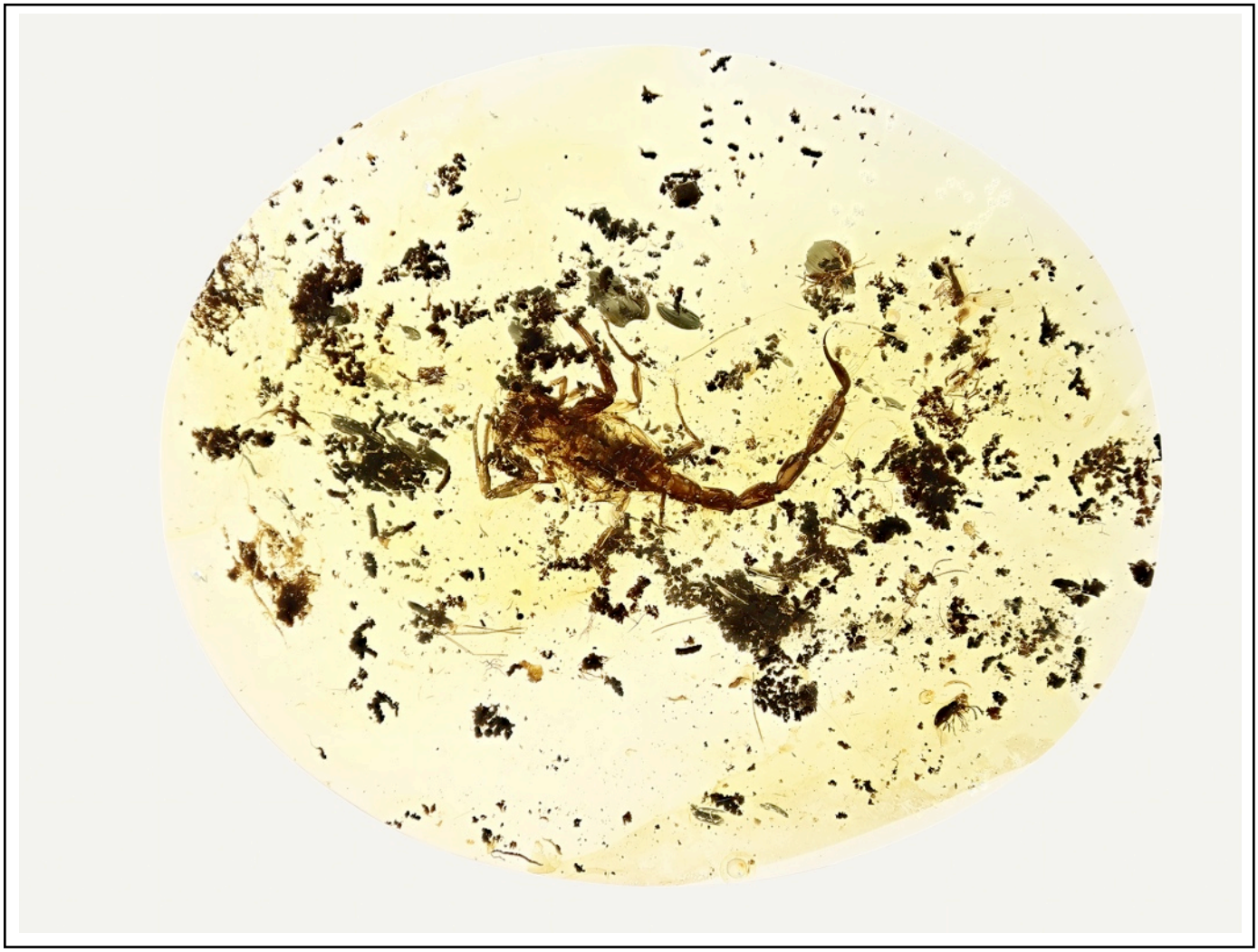

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Reanalysis of the family Palaeoburmesebuthidae Lourenço, 2015, the first described scorpion lineage from Cretaceous Myanmar amber

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Scorpion;
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andreschmidti;
fossil;
taxonomy;
description;
trichobothrial patterns;
new species;
variability;
Burmite.

Abstract. – The study of a new, particularly well-preserved scorpion specimen belonging to the genus *Betaburmesebuthus* Lourenço, 2015 (family Palaeoburmesebuthidae) from Cretaceous Burmite, allows the description of one additional new species. The highly speciose genus *Betaburmesebuthus* has seen a marked increase in the number of described species in recent years; making the description of each new taxon dependent on remarkably well-preserved specimens. The complete trichobothrial pattern of a species of *Betaburmesebuthus* is defined for the first time and is confirmed as A-*Beta* orthobothriotaxic. Both patterns, A-*Alpha* and A-*Beta* are now confirmed among members of the family Palaeoburmesebuthidae. The discovery of this new species brings further evidence to the remarkable diversity that prevailed in the Burmite fauna.

Lourenço W. R. & Velten J., 2026. – Reanalysis of the family Palaeoburmesebuthidae Lourenço, 2015, the first described scorpion lineage from Cretaceous Myanmar amber. *Faunitaxys*, 14(52): 1 – 9.

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Introduction

Early studies on scorpions trapped in amber date back to the first half of the 19th century, but for a long time these fossils remained little more than curiosities. A modest revival began in the early 1980s, when a few specimens were described from Dominican and Mexican amber; however, the fossils from these deposits were invariably closely related to extant scorpion taxa from the Neotropical region. By the mid-1990s, new specimens from Baltic amber had become available, leading to the description of a substantial number of new genera and species over a period of about 20 years (see Lourenço, 2023 for details). Studies and descriptions of scorpions from Cretaceous amber began only at the turn of the 21st century, first with Lebanese amber, followed shortly thereafter by Myanmar and French ambers; the Cretaceous amber of Myanmar is also commonly referred to as Burmite (Lourenço, 2023).

The founder scorpion element described from Burmite was the genus *Palaeoburmesebuthus*, which was originally placed as *incertae familiae* (Lourenço, 2002). This genus was subsequently accommodated in its own family, Palaeoburmesebuthidae Lourenço, 2015 (Lourenço, 2015). During the first quarter of the century, the number of new discoveries and descriptions from Burmite has proved remarkable, including new families, subfamilies, genera and species (Lourenço, 2023).

Among the several scorpion groups described from Burmite, some remain poorly represented, whereas others have proved to be noticeably speciose, such as the families Palaeoburmesebuthidae Lourenço, 2015 and Chaerilobuthidae Lourenço & Beigel, 2011 (Lourenço & Velten, 2025a,b,c, 2026). As previously discussed, the proliferation of new descriptions, especially when based on insufficiently diagnostic material or inadequate comparative analyses, may create additional problems for future identifications, since many species of Palaeoburmesebuthidae show very similar morphologies (Lourenço & Velten, 2025a,b,c). For this reason, the members of this family represent a major challenge for precise identification. Following the descriptions of numerous new species for the genera *Palaeoburmesebuthus* and *Betaburmesebuthus*, this situation led the senior author to refrain for several years from describing additional species, even though during the same period he was able to examine a considerable number of specimens belonging to both genera (Lourenço, 2023). More recently, however, some exceptionally well-preserved specimens have again made it possible to describe new species of both *Palaeoburmesebuthus* and *Betaburmesebuthus* (Lourenço & Velten, 2025 a,b,c).

In the present contribution, a new, nearly complete specimen showing a distinctive combination of characters is studied and described as a new species of the species-rich genus *Betaburmesebuthus* Lourenço, 2015. This new addition once again confirms the considerable diversity of scorpions in the amber-producing forests of Cretaceous Myanmar.

Reviewer: Eric Ythier (*BYG Taxa*, *France*) - ZooBank: https://zoobank.org/06FD0852-A88E-49E5-B8E6-E1494B86C4E1

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Material and methods

The specimen investigated is preserved in a very clear piece of pale-yellow resin which measures 22 x 17 x 2-3 mm. A number of syninclusions are present, mostly composed by vegetal debris and some rare insects. The observation of almost the totality of the structures can be performed however without any major difficulty.

The scorpion representing the new species is totally complete and most structures only slightly suffered during the process of recovering by the resin. Moreover, the resin is rather pale and largely translucid, consequently, most characters are clearly visible, and some even by transparency. This is the first specimen of the genus Betaburmesebuthus for which all the trichobothria can be clearly identified.

The schematic drawings provided represent an objective interpretation of what was observable. Illustrations and measurements were produced with the aid of a Wild M5 stereomicroscope equipped with a drawing tube (camera lucida) and an ocular micrometre. Measurements follow Stahnke (1970) and are given in mm. Trichobothrial notations are those of Vachon (1974, 1975). Cheliceral nomenclature follows Vachon (1963). Other morphological terminologies mostly follow Hjelle (1990). Trichobothria have been recorded based on the observation of the bothria (areoles), and only a few were confirmed through the observation of thin hairs. Considering the morphologies of pedipalp and pectines the scorpion is most certainly a male and probably represents a juvenile.

Remarks on some taxonomic decisions recently expressed by diverse authors

The investigation of specimens trapped in amber follows a protocol broadly similar to that used for extant specimens. However, several limitations may affect the study of amber inclusions, including the quality and opacity of the amber, the position of the specimen within the resin, and the state of preservation of the fossil itself. In many cases, some characters are not clearly visible or cannot be observed at all.

In the particular case of Burmite, the first described scorpion, *Palaeoburmesebuthus grimaldii* Lourenço, 2002, was largely incomplete; nevertheless, because of its novelty, a new genus and species were proposed, although the taxon was originally placed as *incertae sedis* at family level (Lourenço, 2002). During the following 25 years, the rapid increase in the number of new descriptions was, in most cases, accompanied by a marked improvement in the quality of the specimens studied (Lourenço, 2023). Since the first synopsis of scorpions trapped in Burmite (Lourenço, 2016), attention has been drawn to the problems that may arise for future identifications, since many species of Palaeoburmesebuthidae show very similar morphologies. Consequently, as the number of known taxa in a given group increases, the quality of the material required for precise descriptions must also increase. A second critical requirement for reliable new descriptions is a thorough knowledge of the previously described fossil taxa. Only such a procedure can reduce the risk of misidentifications. This requirement is difficult to meet, however, because much of the type material is deposited in private collections and has therefore not been available for examination by subsequent authors.

Among the scorpions found in Burmite, the members of Palaeoburmesebuthidae, together with those of Chaerilobuthidae Lourenço & Beigel, 2011, remain among the most difficult groups for new taxonomic work, owing to the large number of described species and their often-similar morphologies (Lourenço, 2023; Lourenço & Velten, 2025a,b,c,d, 2026).

Recently, Santiago-Blay et al. (2022) and Xuan et al. (2023) described new species, in some cases based on incomplete specimens or assigned to genera whose limits remain imprecise. The description of new species by any author is, of course, a normal taxonomic procedure. Nevertheless, in groups such as Palaeoburmesebuthidae, new descriptions and reassessments should be based on sufficiently preserved specimens, explicit diagnostic characters, and careful comparison with previously described taxa. Otherwise, they may further complicate future identifications.

A related problem concerns taxonomic reassessments based mainly on previously published data rather than on direct examination of the relevant material. In some cases, original descriptions are criticized without re-examination of the type specimens, and the criticisms themselves rely largely on the observations, illustrations, or photographs provided by the authors being criticized. Such an approach may obscure the distinction between new evidence and secondary reinterpretation, and may lead to unstable taxonomic conclusions (Lourenço, 2023).

Consequently, some theoretical speculations or recommendations recently proposed by Santiago-Blay et al. (2022) and Xuan et al. (2023) appear, in our opinion, insufficiently supported by the available evidence. Several points raised by these authors require clarification, particularly because they concern the quality of illustrations, the interpretation of trichobothria, and the recognition of bothriotaxic patterns in Palaeoburmesebuthidae.

First, these authors commented on the quality of preparation of the specimens studied and on the quality of the photographic documentation. Both aspects have improved considerably in recent years, as a result of better preparation techniques, higher-quality specimens, and improved photographic equipment. Nevertheless, the interpretation of some characters in amber inclusions remains constrained by the position and preservation of each specimen.

Second, some criticisms concerned the accuracy of our line drawings, particularly with regard to the identification of trichobothria. These criticisms are not supported by the evidence presented. Line drawings remain a standard method for representing characters that cannot always be clearly documented in photographs, especially in fossil specimens preserved in amber. Moreover, the distinction between ordinary setae and trichobothria was made according to the standard criteria used in scorpion taxonomy, including the observation of bothria whenever possible.

Finally, Xuan et al. (2023) rejected the existence of an A-Alpha pattern in *Palaeoburmesebuthus*. This conclusion appears premature. The A-Alpha pattern was previously documented by Lourenço (2015) and was more recently confirmed by Lourenço & Velten (2025a) and Lourenço (2026). Until these observations are directly reassessed on the basis of adequately preserved material, the rejection of the A-Alpha model cannot be considered demonstrated.

One last point; when our article was already in a stage of revision, we became aware of the taxonomic modifications proposed by Prendini (2026), particularly concerning the familial, subfamilial and generic positions of a large array of scorpion groups, and in particular of several amber fossil groups. Obviously, many of these modifications are once again rejected in the present study, mostly based on our extensive experience with amber fossil scorpions which started 30 years ago. It is at present considered that many of the decisions proposed by Prendini (2026) remain insufficiently supported and, in several cases, appear speculative. In fact, Prendini relies his decisions entirely on the previous decisions of Xuan et al. (2022, 2023, 2025), as he has no expertise in fossil scorpions. It seems interesting to recall that the fields of expertise of these last authors seems not limited to scorpions but is also broadly dispersed with the recent production of results on birds, insects, ammonites and parasites. As such, the

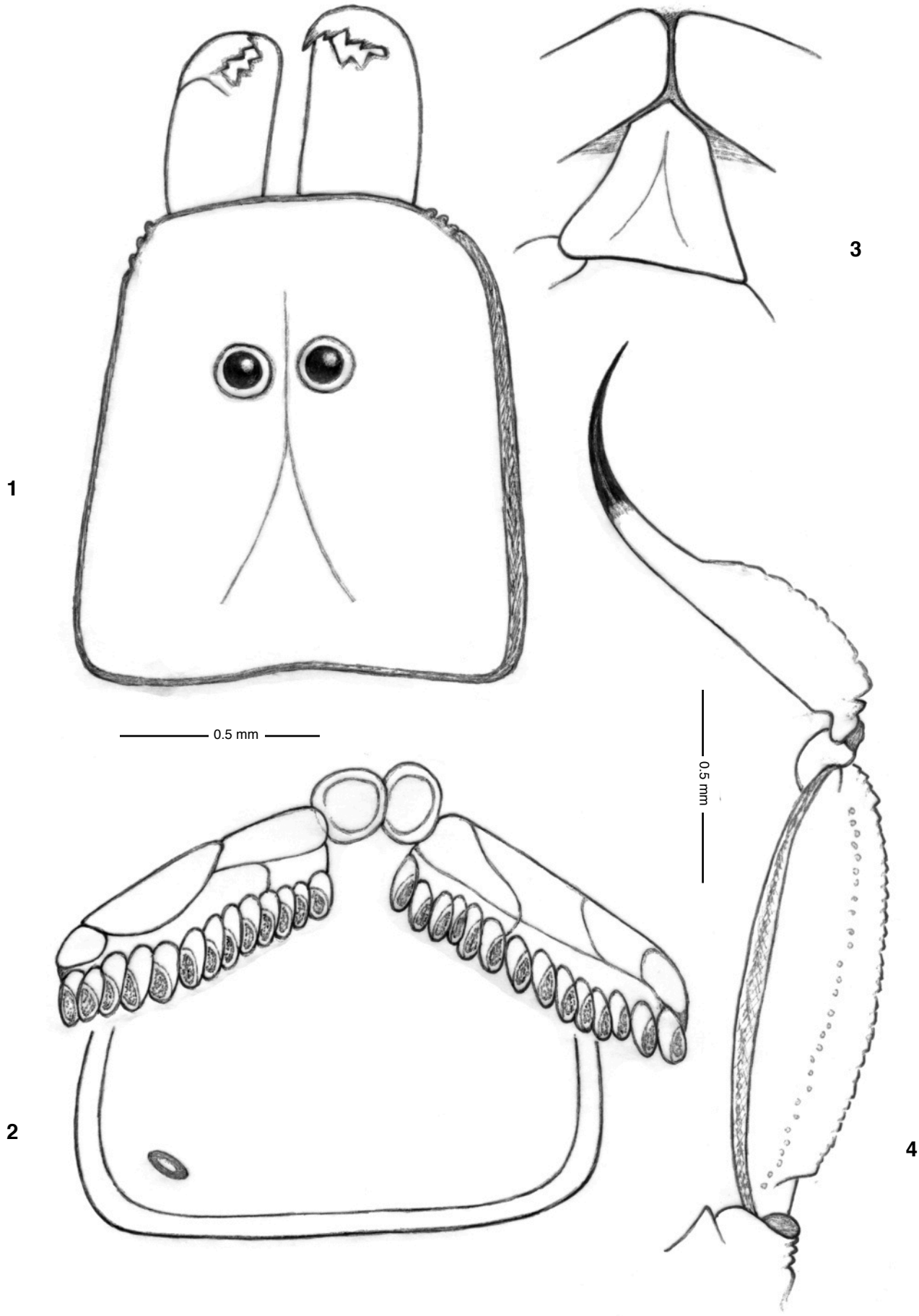

Fig. **1**-**4**. *Betaburmesebuthus andreschmidti* Lourenço **sp**. **n**. Male holotype. **1**. Carapace and chelicerae, dorsal aspect. **2**. Pectines and sternite showing spiracle. **3**. Sternum, in detail. **4**. Metasomal segment V and telson, lateral aspect.

adoption of the changes proposed by Prendini (2026) would contribute to increased uncertainty rather than clarity in the global classification of scorpions.
Several additional points still require clarification and will be addressed in a separate contribution currently in preparation.

Taxonomic treatment of the new species

Superfamily **Buthoidea** C. L. Koch, 1837

Family **Palaeoburmesebuthidae** Lourenço, 2015

Genus ***Betaburmesebuthus*** Lourenço, 2015

Betaburmesebuthus andreschmidti Lourenço **sp**. **n**.

(Fig. 1-16)

ZooBank: https://zoobank.org/75C9E2AB-F50A-44DD-8D13-D16227B992D5

Diagnosis. – As for several previously studied specimens, the general morphology is globally similar to that of other species of the genus *Betaburmesebuthus* Lourenço, 2015. A combination of several characters can, however be used to diagnose the new species: Carapace elongated, weakly granulated to smooth and with the anterior margin marked by a weak convexity. Sternum slightly subpentagonal to almost triangular. Pectines short with 14-13 teeth and absence of fulcra. Tergites with one weak median carina, the lateral carinae are totally inconspicuous. Sternites with small to moderate oval to semi-slit-like spiracles. Metasomal segments I and II with 10 carinae; III and IV with 8 carinae; dorsal carinae on segments III and IV with very minor spinoid granules; setation on all metasomal segments weakly marked; telson elongated (see graph) with a few ventral granules. Internal faces of femur and patella with only minute spinoid granules. Fixed and movable fingers of pedipalp chela with 6-7 series of small rounded granules separated by two conspicuous spinoid accessory granules; the extremity of fingers with 3 strong spinoid granules. Trichobothrial pattern conforming with the extant buthid type A, orthobotriotaxic (Vachon, 1974): 4 internal, 5 dorsal and 2 external trichobothria on femur; dorsal trichobothria disposed in beta (β) configuration (Vachon, 1975); patella with 1 internal and 5 dorsal trichobothria; seven external can also be confirmed by the presence of fine setae and also the observation of several bothria; Chelal hand with 6 dorso-external and 2 ventral trichobothria; 7 trichobothria on fixed finger, including one internal. Conspicuous tibial spurs present on legs III and IV.

Holotype. – In account of the size and morphology of some structures, the holotype is a juvenile and most certainly a male. The specimen is included in a very clear block of pale-yellow amber which measures 22 x 17 x 2-3 mm. A number of syninclusions are present, mostly composed by vegetal debris and some rare insects; these however don't prevent the observation of most characters.

Type locality and horizon. – Myanmar (Burma), Kachin; precise locality remains uncertain; Lower Cretaceous.

Patronym. – The specific name honours Mr André Schmidt (Zofingen, Switzerland) who supported the present study.

Repository. – The type specimen is deposited in the collection of Mr André Schmidt (Zofingen Switzerland).

Description

Coloration. – The scorpion is yellow to pale yellow; carapace and tergites yellow; metasomal segments yellow to reddish-yellow; telson reddish-yellow; pedipalps yellow to reddish-yellow; legs yellow to reddish-yellow. Ventral aspect yellow. Some observed darker zones certainly correspond to the oxidation of the resin.

Morphology. – Carapace elongated, weakly granular to almost smooth; anterior margin with a weakly marked median convexity. Carinae inconspicuous; furrows weak. Median ocular tubercle clearly anterior to the centre of carapace; median eyes moderate to large in size and separated by less than one ocular diameter. Three pairs of lateral eyes of moderate size. Sternum subpentagonal to almost triangular. Mesosomal tergites weakly granular, with one weak median carina; lateral carinae totally inconspicuous; VII with five weakly marked carinae. Pectines reduced in size and with a total number of 14-13 teeth; fulcra absent. Genital operculum formed by two semi-oval plates of moderate size. Sternites smooth, with small oval to almost slit-like spiracles. Metasomal segment I to IV with 10-10-8-8 carinae; dorsal on III and IV with only minute spinoid granules not forming serrulas; segment V slender with five carinae; ventral formed by minute spinoid granules; dorsal aspect of segments I to V weakly depressed; setation on all segments weakly marked. Telson with a very long pear-shaped vesicle; presence of vestigial latero-ventral carinae and a series of minute ventral spinoid granules; aculeus markedly long (see graph-Fig. 17) and strongly curved at the extremity; setation moderately marked. Cheliceral dentition only partially visible; fixed and movable fingers with one basal tooth observable; distal teeth moderately long (Vachon, 1963). Pedipalp femur pentacarinate; patella with 6-7 carinae; internal face of femur and patella with only minute spinoid granules. Chela with moderately marked carinae; all faces not granular; internal face with one conspicuous spinoid granule. Fixed and movable fingers of pedipalp chela with 6-7 series of small rounded granules separated by two conspicuous spinoid accessory granules; the extremity of fingers with 3 strong spinoid granules; setation of pedipalps almost absent. Trichobothriotaxy type A orthobothriotaxic (Vachon, 1974); dorsal trichobothria of femur in beta (β) configuration (Vachon, 1975). For details refer to the diagnosis. Conspicuous tibial spurs present on legs III and IV.

Relationships. – The presence of small pectines with only 14-13 teeth associates the new species to a small number of other species, namely *B. muelleri* Lourenço, 2015, *B. villosus* Xuan et al., 2023 and *B. vinzentschmidti* Lourenço, 2023. The new species can however be isolated from these three other species by a number of features, (i) absence of spiniform granules on the internal faces of femur and patella and absence of serrulas on the dorsal carinae of metasomal segments III and IV both present in *B. vinzentschmidti*, (ii) small pectines with absence of fulcra which are present in *B. villosus*, (iii) spiracles not round as in *B. muelleri* but almost slit-like. The new species is also characterized by a carapace with an anterior margin slightly convex and a sternum almost triangular.

Concluding remarks

The description of an additional species of *Betaburmesebuthus* confirms once again the remarkable diversity of scorpions preserved in Cretaceous Myanmar amber. At the same time, it reinforces the need for caution in the taxonomy of Palaeoburmesebuthidae, a family in which many species show closely similar morphologies and in which several diagnostic characters may be obscured by the position or preservation of the specimen in amber.
The new specimen described here is exceptional because it allows the observation of a sufficiently complete set of characters, including the trichobothrial pattern. This represents an important addition to the diagnosis of *Betaburmesebuthus* and confirms the presence of type A-β orthobothriotaxy in this genus. Together with previously documented A-α patterns in other members of Palaeoburmesebuthidae, this result shows that both models are present within the family.
Future descriptions of species belonging to this complex should therefore be based, whenever possible, on specimens of comparable quality, with clearly observable diagnostic structures and explicit comparisons with previously described taxa. This is especially important in fossil groups known from numerous species but often represented by material that is difficult to interpret.

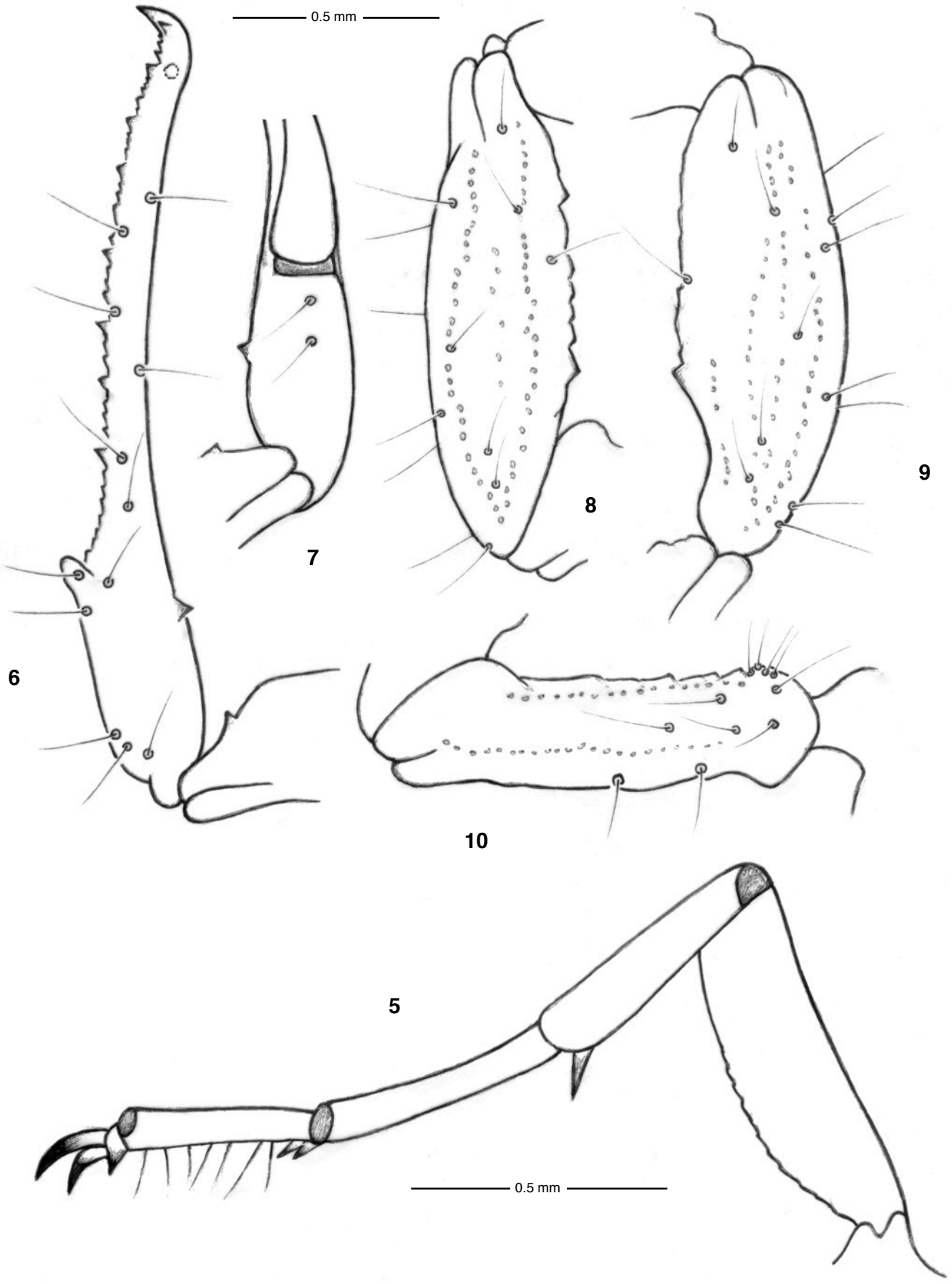

Fig. **5**-**10**. *Betaburmesebuthus andreschmidti* Lourenço **sp**. **n**. Male holotype. **5**. Leg IV showing spurs. **6**-**10**. Trichobothrial pattern. **6**-**7**. Left chela, dorso-external and ventral aspects. **8**-**9**. Left and right patella, dorsal aspect. **10**. Left femur, dorsal aspect.

Table I. ***Morphometric values*** (mm). Male holotype of *Betaburmesebuthus andreschmidti* Lourenço **sp**. **n**.

– ***Total length*** (including telson) 10.07

– ***Carapace***
length 1.34
anterior width 0.87
posterior width 1.14

– ***Mesosoma*** length 2.14

– ***Metasomal segments***
I: length 0.81, width 0.62;
II: length 0.87, width 0.54;
III: length 0.87, depth 0.47;
IV: length 1.10, depth 0.47;
V: length 1.47, depth 0.42.

– ***Telson*** length 1.47.

– ***Vesicle*** depth 0.26.

– ***Pedipalp***
femur length 1.21, width 0.27;
patella length 1.27, width 0.37;
chela length 1.87, width 0.27;
movable finger length 1.34.

Tables II & III and graph

A distinctive morphological feature of the genera *Palaeoburmesebuthus* and *Betaburmesebuthus* is the presence of a generally long telson. The proportions of the telson, particularly the relationship between length and height, may provide useful diagnostic information for distinguishing several species. A synthesis of the available measurements is presented in Tables II and III for all known species in which this character can be assessed. This relationship is also illustrated graphically in Fig. 17.

Table II. **Genus *Betaburmesebuthus* - Reports (R) between Telson length (L) vs depth (D)**

Betaburmesebuthus kobberti Lourenço, 2015 - Male
Telson – L = 1.47, D = 0.30 – R = **4.90**
Betaburmesebuthus muelleri Lourenço, 2015 - Male
Telson – L = 1.34, D = 0.34 – R = **3.94**
Betaburmesebuthus bidentatus Lourenço, 2015 - Male
?
Betaburmesebuthus fleissneri Lourenço, 2016 - Male
Telson – L = 1.62, D = 0.34 – R = **4.76**
Betaburmesebuthus bellus Lourenço, 2016 - Male
Telson – L = 1.47, D = 0.37 – R = **3.97**
Betaburmesebuthus larafleissnerae Lourenço, 2016 - Male
Telson – L = 1.67, D = 0.40 – R = **4.18**
Betaburmesebuthus joergi Lourenço & Rossi, 2017 - Female
Telson – L = 2.54, D = 0.62 – R = **4.10**
Betaburmesebuthus villosus Xuan, Cai & Huang 2023 - Male
Telson – L = 2.46, D = 0.53 – R = **4.64**
Betaburmesebuthus fuscus Xuan, Cai & Huang 2023 - Male
?
Betaburmesebuthus vinzentschmidti Lourenço, 2023 - Male
Telson – L = 2.19, D = 0.34 – R = **6.44**
Betaburmesebuthus thomasvelteni Lourenço, 2023 - Female
Telson – L = 1.74, D = 0.27 – R = **6.45**
Betaburmesebuthus groehni Lourenço, 2025 - Male
Telson – L = 1.55, D = 0.27 – R = **5.74**
Betaburmesebuthus petersi Lourenço, 2025 - Male
Telson – L = 2.22, D = 0.54 – R = **4.12**
***Betaburmesebuthus andreschmidti* sp. n. Lourenço, 2026 - Male**
Telson – L = 1.47, D = 0.26 – R = 5.65

Table III. **Genus *Palaeoburmesebuthus* - Reports (R) between Telson length (L) vs depth (D)**

Palaeoburmesebuthus grimaldii Lourenço, 2002 - Male
Telson – L = 1.45, D = 0.26 – R= **5.58**
Palaeoburmesebuthus ohlhoffi Lourenço, 2015 – Male*
Telson – L = 1.82, D = 0.34 – R = **5.35**
The originally indicated value of 3.16 for length proved to be a printed error.
Palaeoburmesebuthus longipalpis Lourenço & Rossi, 2017 - Male
?
Palaeoburmesebuthus knodeli Lourenço, 2018 - Male
Telson – L = 1.67, D = 0.40 – R= **4.18**
Palaeoburmesebuthus smithi - Male
Telson – L = 1.13, D = 0.27 – R= **4.19**
Palaeoburmesebuthus andrewrossi - ?
Telson – L = 2.83, W = 0.63 – R= **4.49**
Palaeoburmesebuthus sarahmeyerae - Male
Telson – L = 1.54, D = 0.21 – R= **7.34**

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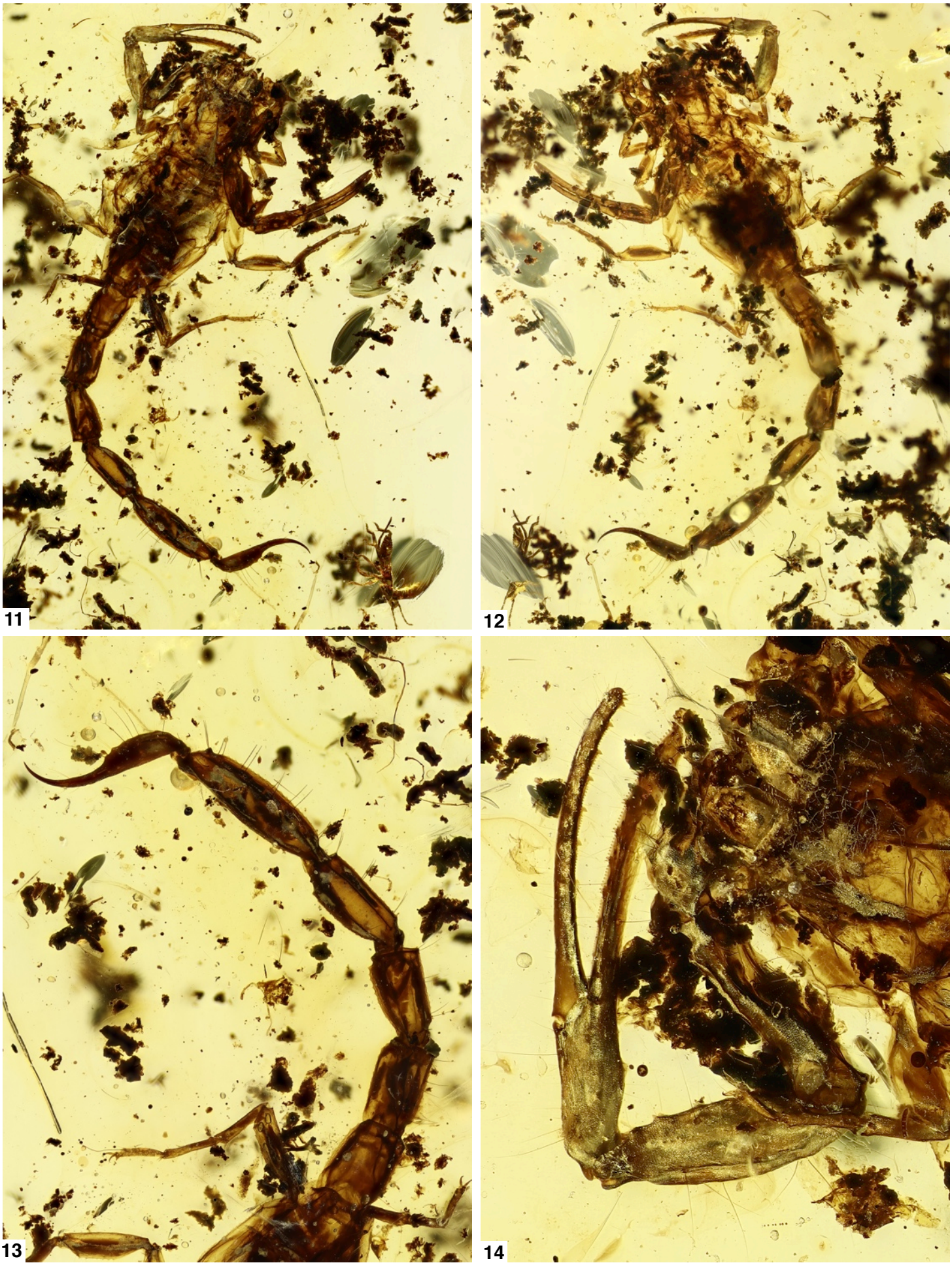

Fig. **11**-**14**. *Betaburmesebuthus andreschmidti* Lourenço **sp**. **n**. Male holotype. **11**-**12**. Habitus, dorsal and ventral aspects. **13**. Telson in detail. **14**. Left pedipalp in detail.

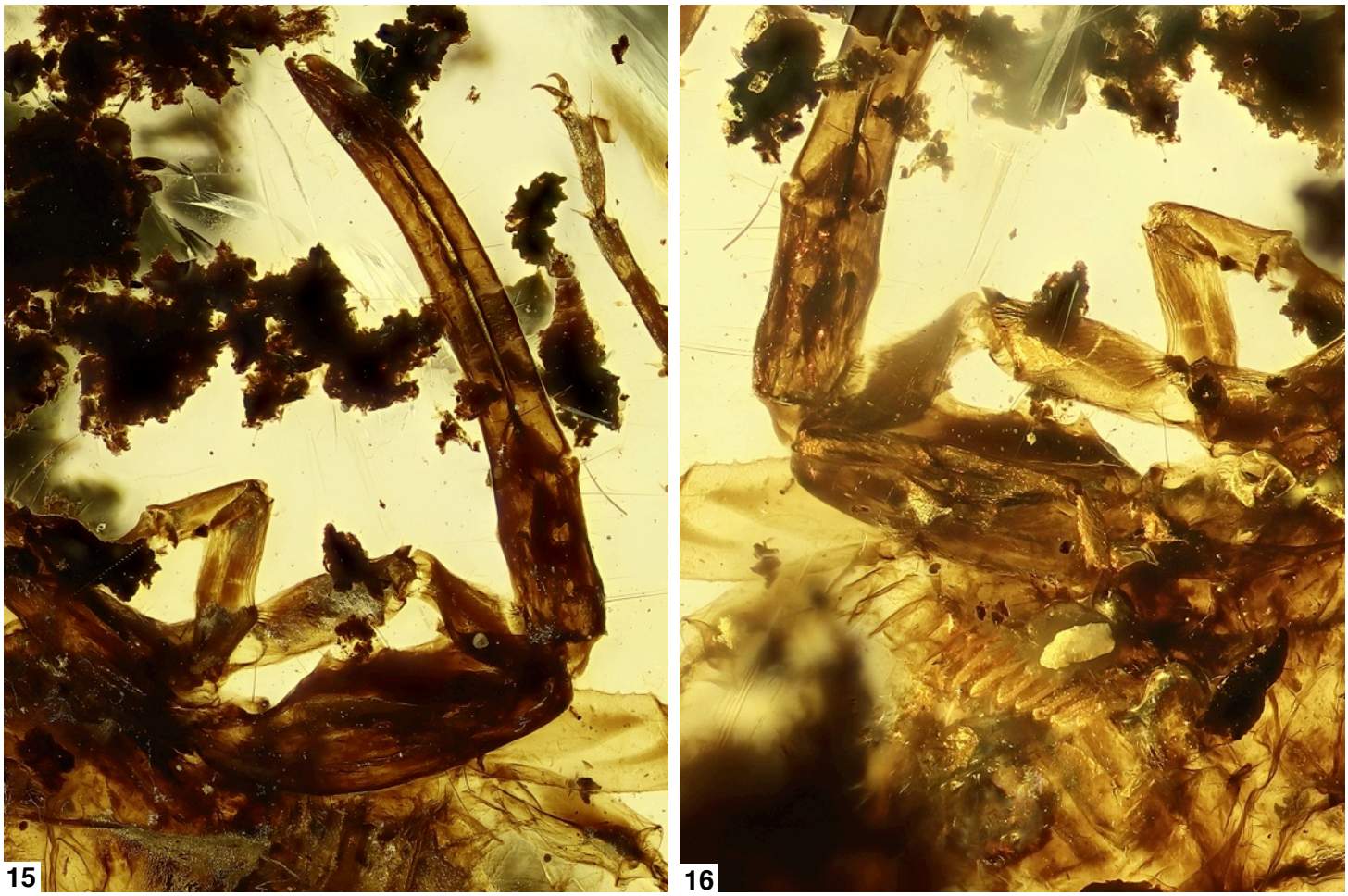

Fig. **15-16**. *Betaburmesebuthus andreschmidti* Lourenço **sp**. **n**. Male holotype. **15**. Right pedipalp in detail. **16**. Ventral aspect showing one pecten in detail

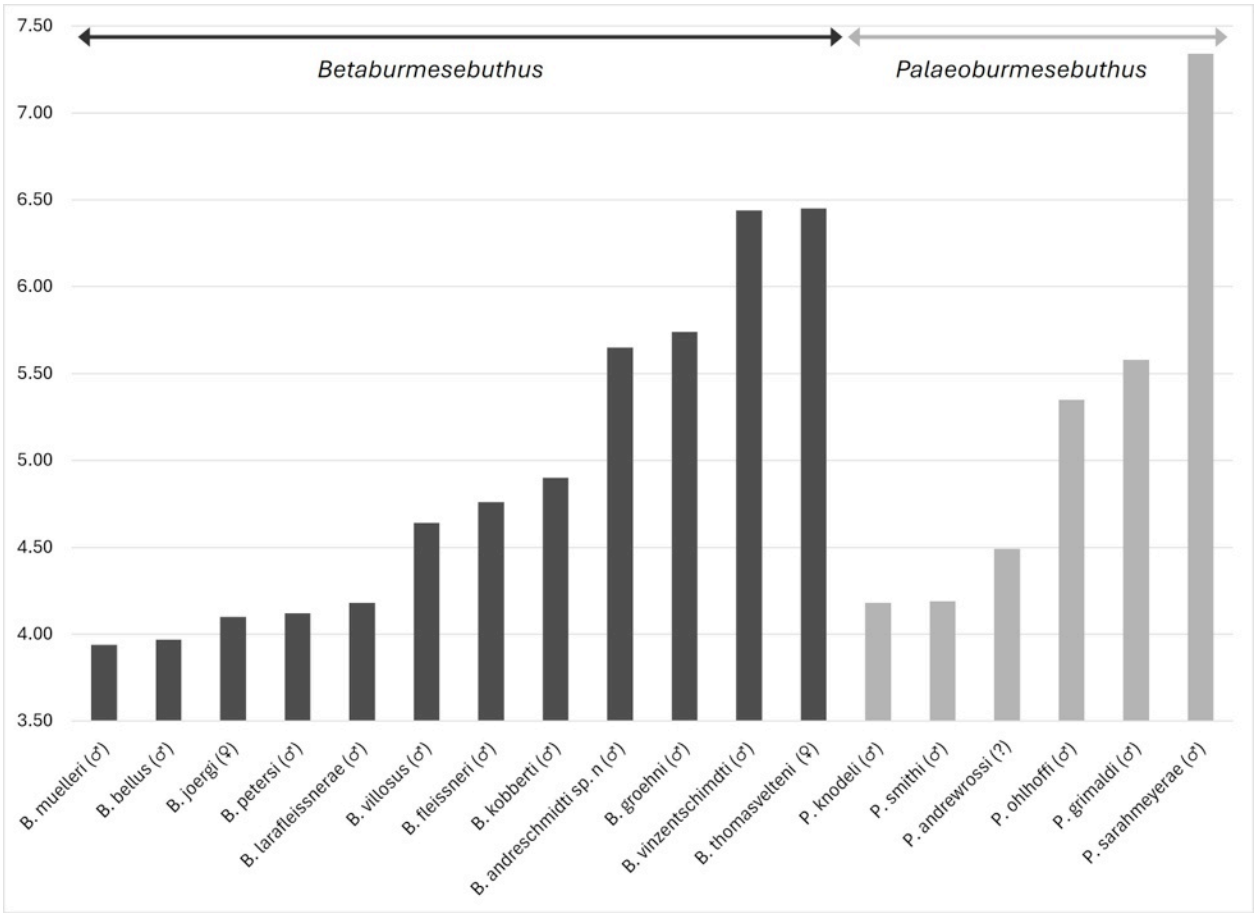

Fig. **17**. Graph showing the reports between telson length vs telson depth in the species of genera *Betaburmesebuthus* and *Palaeoburmesebuthus*.

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Author's contribution [1]

Publisher Correspondence. – WL
Writing the article. – WL
Description. – WL
Article proofreading. – WL
Bibliographic work. – WL
Material study. – WL & JV
Author of the figures. – WL (Fig. 1-10, 17).

[1] **WL** = Wilson R. Lourenço – **JV** = Jürgen Velten.

Résumé

Lourenço W. R. & Velten J., 2026. – Une réanalyse de la famille des Palaeoburmesebuthidae Lourenço, 2015, la première lignée de scorpions décrite de l'ambre Crétacé de Birmanie. *Faunitaxys*, 14(52): 1 – 9.

L'étude d'un nouveau spécimen particulièrement bien préservé de scorpion appartenant au genre *Betaburmesebuthus* Lourenço, 2015 (famille des Palaeoburmesebuthidae) de l'ambre du Crétacé inférieur du Myanmar, autorise la description d'une nouvelle espèce. Le genre très diversifié *Betaburmesebuthus* a connu une croissance notable dans le nombre d'espèces décrites depuis quelques années, exigeant pour chaque nouvelle description des spécimens de mieux en mieux préservés. Le modèle trichobothrial global d'une espèce de *Betaburmesebuthus* est défini pour la première fois comme A-*Beta* orthobothriotaxique. Les deux modèles A-*Beta* et A-*Alpha* sont désormais confirmés pour les éléments de la famille des Palaeoburmesebuthidae. La découverte de ce nouvel élément confirme une fois de plus, l'existence d'une importante diversité au sein de la faune trouvée dans l'ambre Crétacé de Myanmar.

Mots-clés. – Scorpiones, *Betaburmesebuthus*, *andreschmidti*, fossile, taxonomie, description, modèles trichobothriaux, nouvelle espèce, variabilité, Ambre Birman.

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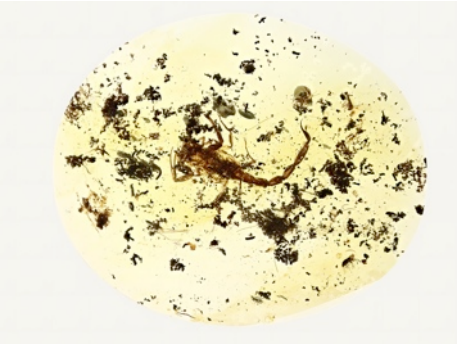

Illustration de la couverture :

Betaburmesebuthus andreschmidti Lourenço **sp**. **n**. in the stone (piece of amber); dorsal aspect.

Crédits:

Wilson R. **Lourenço** : Fig. 1-10.

Alexander Beigel : Fig. 11-16 & couverture.

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